LAW OFFICES
GOLDBERG, GODLES, WIENER & WRIGHT LLP
1229 NINETEENTH STREET, N.W.
WASHINGTON, D.C. 20036-2413

HENRY GOLDBERG
JOSEPH A. GODLES
JONATHAN L. WIENER
DEVENDRA ("DAVE") KUMAR

HENRIETTA WRIGHT
THOMAS G. GHERARDI, P.C.
COUNSEL

THOMAS S. TYCZ*
SENIOR POLICY ADVISOR
*NOT AN ATTORNEY

(202) 429-4900
TELECOPIER:
(202) 429-4912
e-mail:
general@g2w2.com
website: www.g2w2.com

September 25, 2015

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Notice of Ex Parte Presentation Re: *Revision of Part 15 of Commission's Rules to Permit Unlicensed National Information Infrastructure Devices in the 5 GHz Band,* ET Docket No. 13-49

Dear Ms. Dortch:

On September 24, 2015, the undersigned and Dr. Kevin J. Negus, CTO, Chairman, & Co-Founder Fastback Networks, Inc. had a telephone conversation with Mark Settle, chief of Policy and Rules Division of the Office of Engineering and Technology ("OET") and Karen Rackley, Aole Wilkins, and Jamison Prime, all of OET. In that call, Dr. Negus covered the points set out in the attached slides.

Please direct any questions to the undersigned.

Respectfully submitted,

Henry Goldberg
Attorney for Fastback Networks, Inc.

Attachment

cc: Mark Settle
Karen Rackley
Aole Wilkins
Jamison Prime

FASTBACK RECOMMENDS ADOPTION OF THE FOLLOWING 3 "WISPA CONSENSUS PROPOSAL" MODIFICATIONS FOR U-NII BAND OOBE LIMITS

Sept 15, 2015

Dr. Kevin Negus

Recommendation #1: Change U-NII-1 OOBE Limits for 5.091 – 5.15 GHz (affects 15.407 b(1) (15.209) and b(7) (15.407))

WISPA Consensus Proposal

- Change 15.209 OOBE range for U-NII-1 to end at 5.091 GHz
- Add a shoulder at -17 dBm/MHz OOBE for 5.091 to 5.15 GHz

Proposed Spec:
-17 dBm/MHz
for 5.091-5.15 GHz

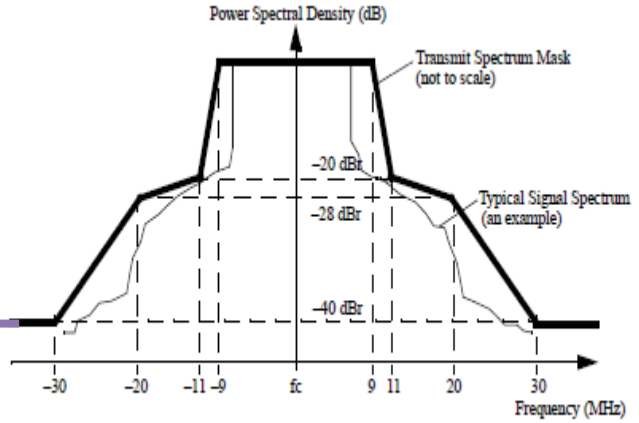


Figure 18-13—Transmit spectrum mask for 20 MHz transmission

Proposed Spec:
Same as Current
Spec for < 5.091 GHz

Current Spec:
-27 dBm/MHz "Max Hold average of the Peaks"
or -41 dBm/MHz "average power"

U-NII-1

4.5 GHz – 5.091 GHz
Restricted band (15.209)

5.091 GHz – 5.15 GHz
Restricted band (15.209)
Licensed to MSS only, with possible future use by AeroMACS.
Two limits invoked: 15.407 b(1) and b(7)
15.407 (b1) refers to 15.209 restricted band limit

Fastback NETWORKS intelligent wireless transport

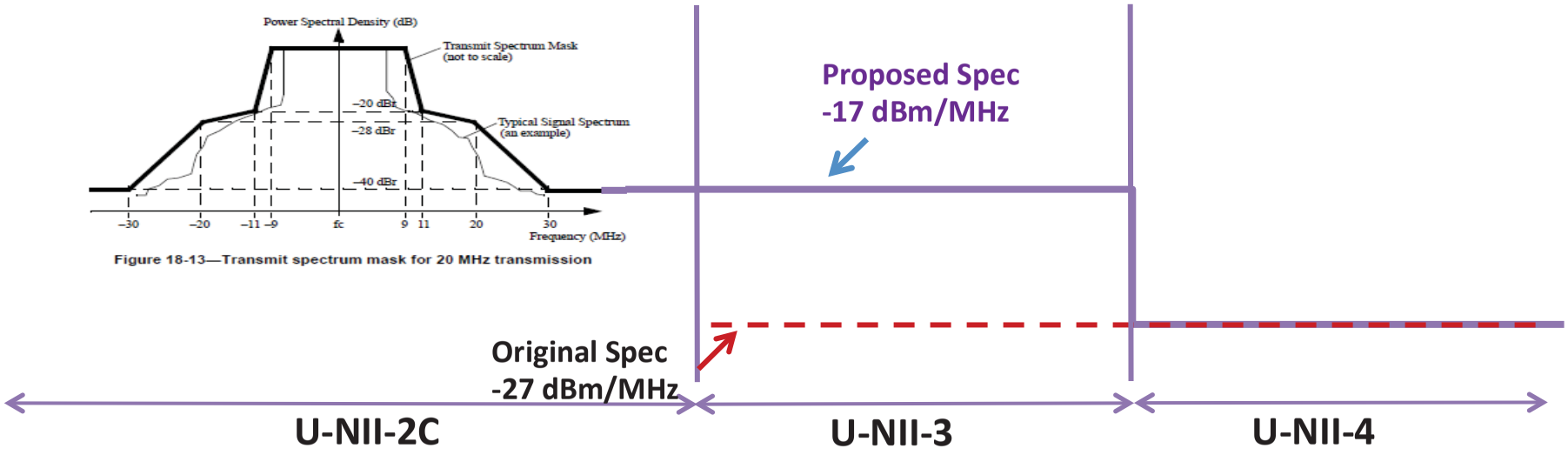
Recommendation #2: Change U-NII-2C OOBE Limits for U-NII-3 (affects 15.407 b(3))

WISPA Consensus Proposal

- Change OOBE limit for U-NII-2C to begin at 5.85 GHz (i.e. border of U-NII-3 and U-NII-4) instead of 5.725 GHz (i.e. border of U-NII-2C and U-NII-3).

- **Current rule:**
- b(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

Figure 18-13—Transmit spectrum mask for 20 MHz transmission



Recommendation #3: Change the U-NII OOBE Measurement Method back to Previous Method

WISPA Consensus Proposal

- DROP THE "MAX HOLD" IN THE OOBE POWER MEASUREMENT
  - Use "average of peak detector output" instead at the appropriate OOBE limit
  - This "average of the peaks" method was used for U-NII OOBE measurements for over 10 years until recently changed to the current "max hold of the peaks" method.

- **CURRENT "MAX HOLD" METHOD:** MEASURES AVERAGE OF PEAK DETECTOR OUTPUT ON SPECTRUM ANALYZER, WITH MAX HOLD TURNED ON, AND WAITS UNTIL TRACE STOPS CHANGING (could be minutes and is often not repeatable)
  - The first fundamental problem is that with highly spectral efficient waveforms such as WiFi, LTE-U or SC-FDE that extremely rare spurious intermodulation products of near-zero time length produce instantaneous peaks of ~11 dB above the "average of the peaks" OOBE that more accurately predicts interference into a communications system receiver
  - Even if TDWR radar receivers were sensitive to this pathological "Max Hold" event, the FCC's current "Max Hold" OOBE measurement procedures apply to non-TDWR portions of U-NII-2 band and even apply to OOBE into bands with no known radar systems

Action Items from 8/24/2015 Call between OET and Fastback Networks

- Why are the U-NII-1 OOBE limits a problem for Point to Point ("P2P") links?
- What are the benefits to users of P2P links from the proposed changes to U-NII-1 OOBE limits?
- How do U-NII-1 P2P links affect other 5091-5150 MHz users if proposed changes to U-NII-1 OOBE limits were adopted?

U-NII-1 OOBE Limits Constrain Transmit Power especially for P2P Links

- practical limits on filtering and intermodulation products restrict ratio of Tx EIRP to OOBE to ~52 dBc for "average Tx power to average OOBE" in an adjacent channel (and this is achieved only by backing off the Tx PA by more than 10 dB)
- thus, -27 dBm/MHz max hold limits Tx EIRP to approximately: -27 dBm/MHz – 11 dB (max hold vs avg.) + 52 dBc (Tx/OOBE ratio) = +14 dBm/MHz, or about +30 dBm EIRP for a 40 MHz channel in the lower half of U-NII-1
- this almost entirely negates the "desired" trade-off that P2P links make for higher allowable EIRP in the "boresight" because the EIRP off boresight is greatly reduced
- however, even though OOBE also greatly reduces off boresight by the antenna directivity the OOBE limits are not scaled to account for increased antenna gain

U-NII-1 OOBE Limits Reduce Range and Throughput especially for Rural Services

- adopting the proposed Recommendation #1 OOBE limits from the WISPA Consensus proposal enables an increase in Tx EIRP for U-NII-1 P2P Links of about 6-10 dB typically
- at an 8 dB increase, this corresponds to an increase in range of typically 250% (for Fastback products this is 10 km versus 25 km “useful” range in rural usage scenarios)
- alternatively, this corresponds to typically a factor of 2 in throughput (for Fastback products at target rural usage of 10 km this is about 500 Mb/s versus 250 Mb/s)

Proposed U-NII-1 OOBE Limits do not harm other 5.091-5.15 GHz occupants

- Incumbent occupant is Globalstar
  - additional interference at satellite repeater receiver due to U-NII-1 OOBE is negligible (i.e. more than 30 dB lower) than interference already present due to U-NII-1 in band transmissions
- Potential new occupant is AeroMACS
  - see analysis herein for impact to AeroMACS due to P2P links in U-NII-1 with proposed OOBE limits

The AeroMACS Communication System

From FCC-15-50A1

"Allocate the 5091-5150 MHz band to the aeronautical mobile service (AMS) on a primary basis for Federal and non-Federal use, limited to aeronautical mobile telemetry (AMT) for flight testing of aircraft and "Aeronautical Mobile Airport Communications System" (AeroMACS) networks."

"The term "AeroMACS" refers to the emerging wireless communications network in the 5091-5150 MHz band that operates in the airport surface domain."

From the International Civil Aviation Organization Working Paper Aeronautical Communications Panel 29th Meeting of Working Group F March 13-19 2014*:

Operating Frequency Band – proposed 5030 – 5150 MHz globally

Transmit EIRP – at least +36 dBm

Tx/Rx Antenna Gain – ~ 13 dBi or ~ 80 degrees in azimuth

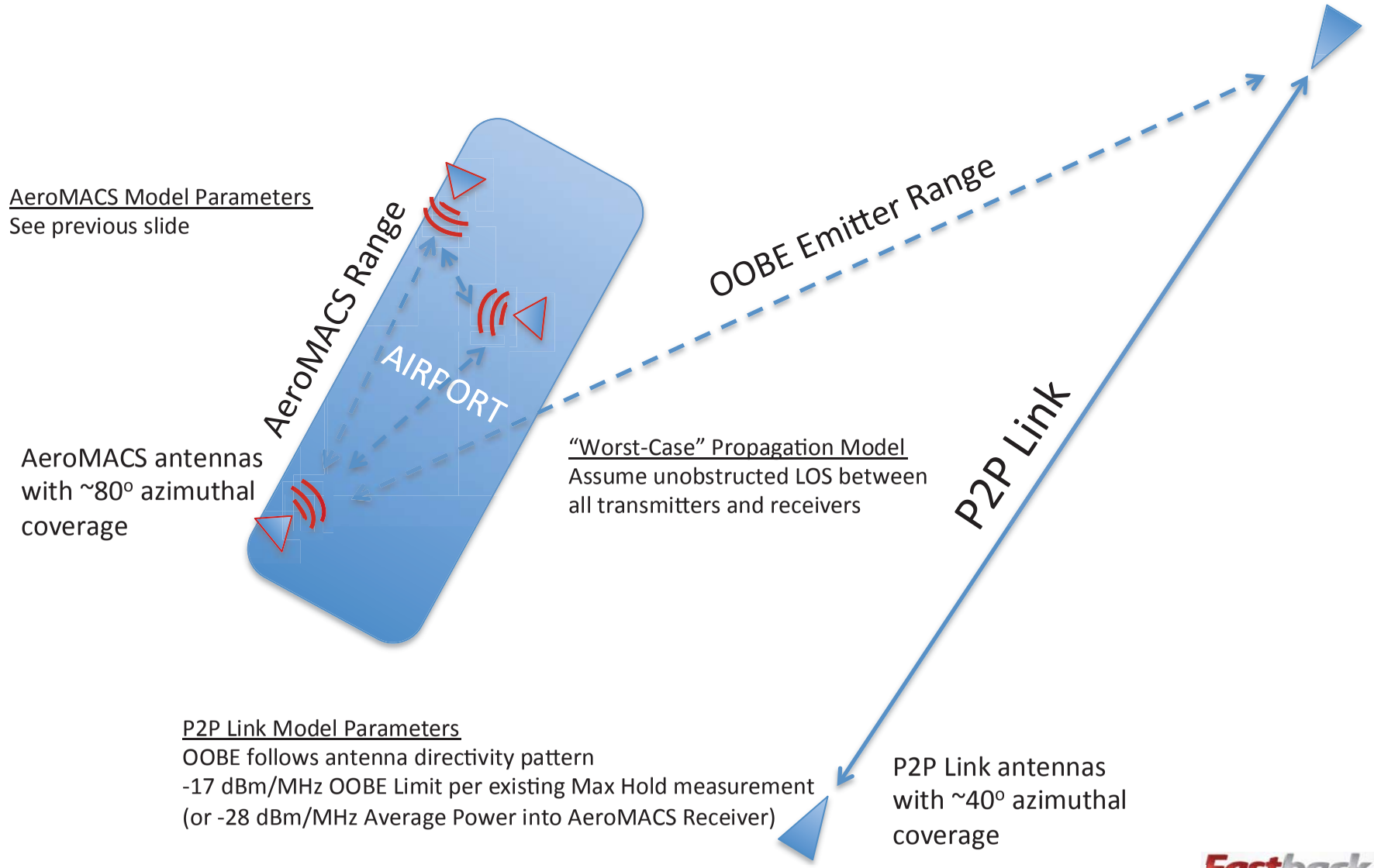
Modulation – OFDM based on WiMax 802.16

Channelization – typically 5 MHz centers or multiples

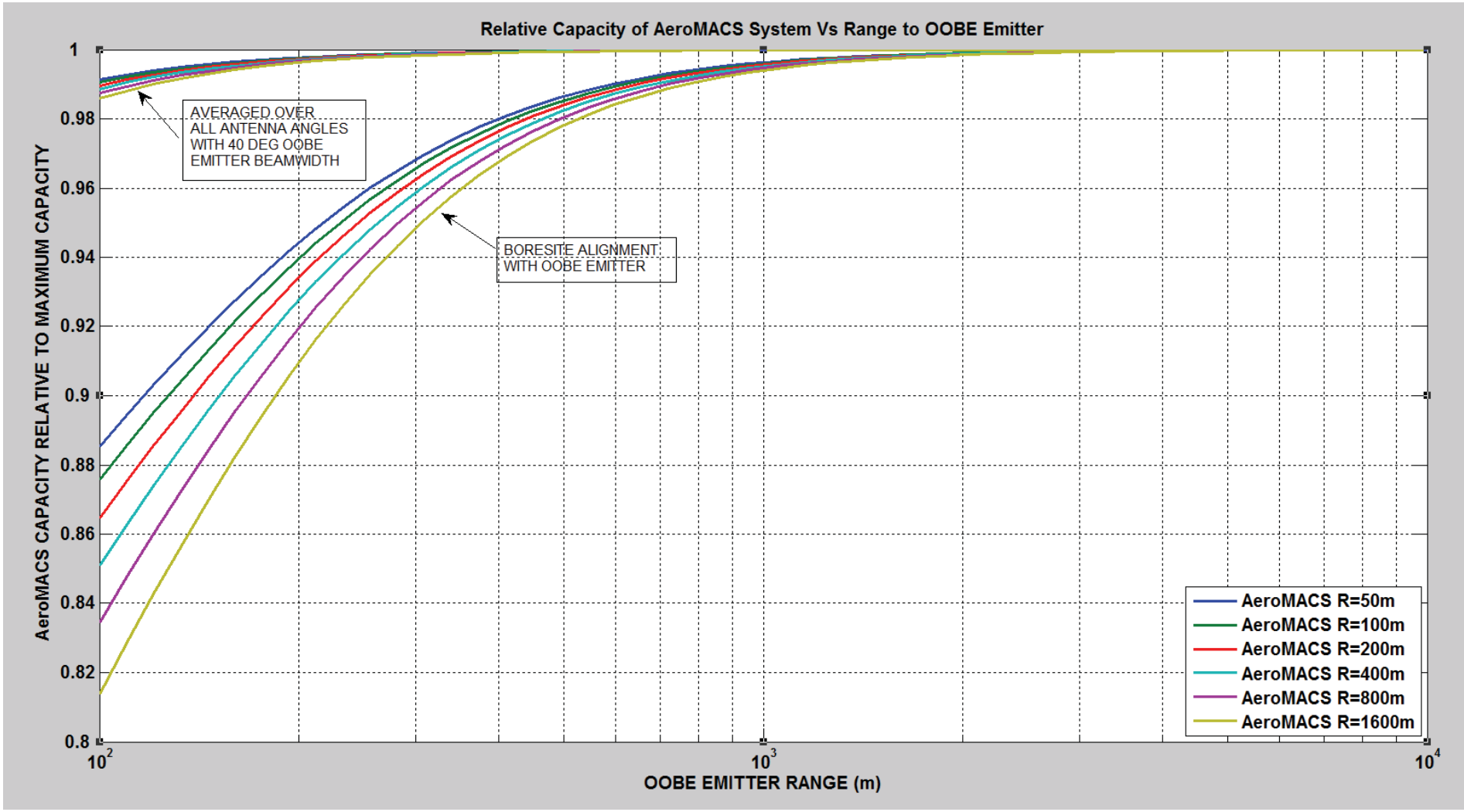
Toulouse Airport Network Trial

* See also, "AeroMACS – A Global Standard for Airport Surface Communications" by Declan Bryne of Wimax Forum at ICNS 2013, or "Aeronautical Mobile Airport Communications System (AeroMACS) for Access to SWIM" by James Budinger of NASA at Demonstration and Prototyping Information Exchange TIM6, Nov. 2010.

Simulation Model for Impact of P2P Link U-NII-1 OOBE Emitter on AeroMACS Link per Recommendation #1



Simulated AeroMACS Impact versus P2P Link U-NII-1 OOBE Emitter Range at the -17 dBm/MHz Recommendation #1 Proposed Limit



Conclusions

- Adoption of WISPA Consensus Proposal Items per Fastback Recommendations #1, #2 and #3 herein is warranted
- Adoption of Fastback Recommendation #1 for P2P Links has direct benefit to underserved rural broadband applications
- Adoption of Fastback Recommendation #1 for P2P Links has no meaningful impact on incumbent or proposed occupants of 5.091-5.15 GHz